National Subsea Research Initiative

Subsea Storage Workshop - Aberdeen

NSRI – the focal point for Research and Development for the UK subsea industry

Peter Blake; NSRI Chairman

2016

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www.nsri.co.uk

Agenda

- **AM**
- Scene setting:
- Economics and context
- State of the Art
- Issues / challenges arising

- **PM**
- Workshop
- Concept Selection
- Construction
- Operations

National Subsea Research Initiative

Subsea Storage overview, economic challenge and meeting objective

NSRI – the focal point for Research and Development for the UK subsea industry

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Overview

- **Reminder of hackathon economics study 2015**
- New work in progress data
- Conclusive remarks

Economics study : Size of Prize

Assumption $60/ bbl

Methodology
Economic viability measure determined from operators profitability discount index, post tax (discounted at 10%) > 0.3;

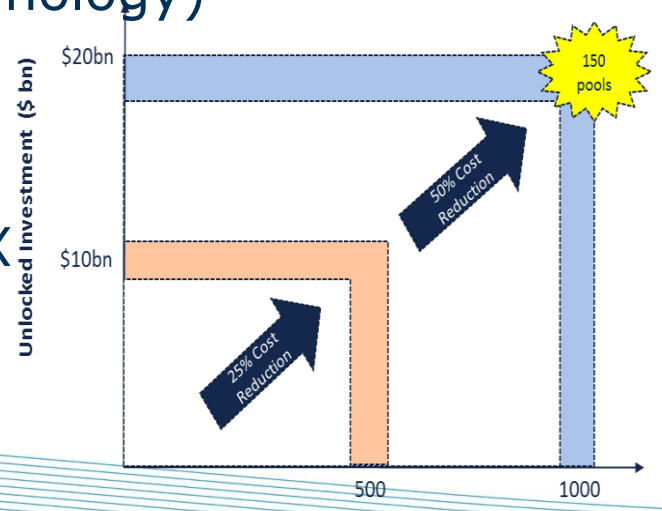
- Production profiles of small pools drawn from DECC and averaged
- Industry norms used to determine CAPEX; OPEX and Decom costs
- Deterministic and probabilistic approaches taken

Economics study : Size of Prize

Results

- The smallest size of pool that becomes economic is 11.MBoe. (existing technology)
- If a cost (C&O) reduction of 25% can be achieved, all things remaining constant, that become 9.1MBoe. (new technology, efficiency measures)
- For a cost reduction of 50% then that becomes 5.8MBoe. (disruptive technology)

This corresponds to opening up approximately 150 of the pools, $19Billion of CAPEX & $16Billion of OPEX and recovers 1.06Billion barrels.



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Draft data from mapping exercise

The following slides are compiled by the OGA as part of their contribution to assisting in MER and the small pools initiative.

This is work in progress and maybe subject to Change

Our objective is to be able to demonstrate to the supply chain the opportunity it's size in value and geographically such that we can fit technology solutions such as storage tanks to real prospects

Oil & Gas Authority

2015 Undeveloped Discoveries Summary

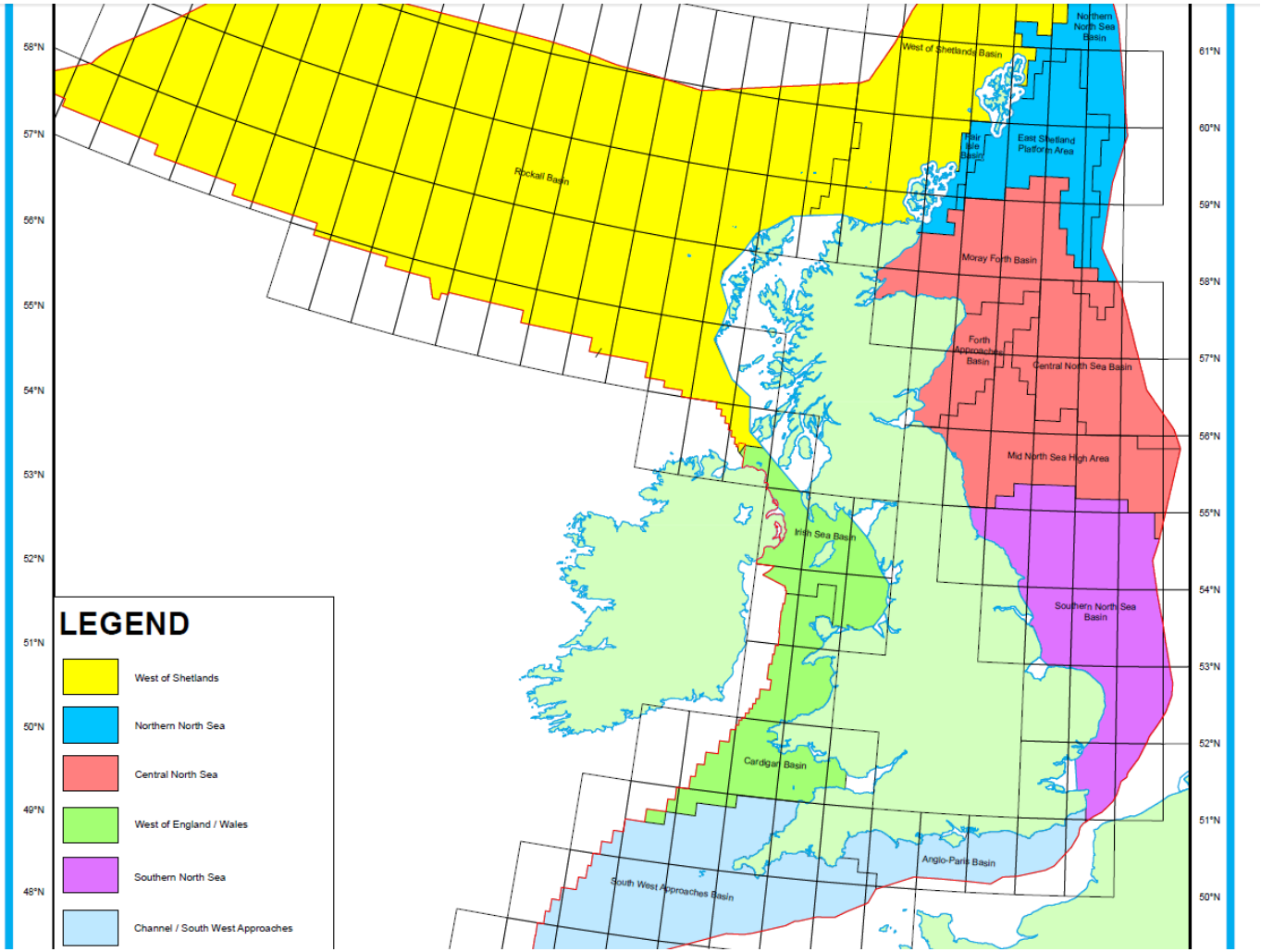
Number of Undeveloped Discoveries = **363**

P50 Recoverable Resources (mmboe)

- <3 = 129 wells
- 3–15 = 171 wells
- 3-100 = 225 wells
- >100 = 4 wells
- No data = 5 wells

Oil & Gas Authority

Area Map



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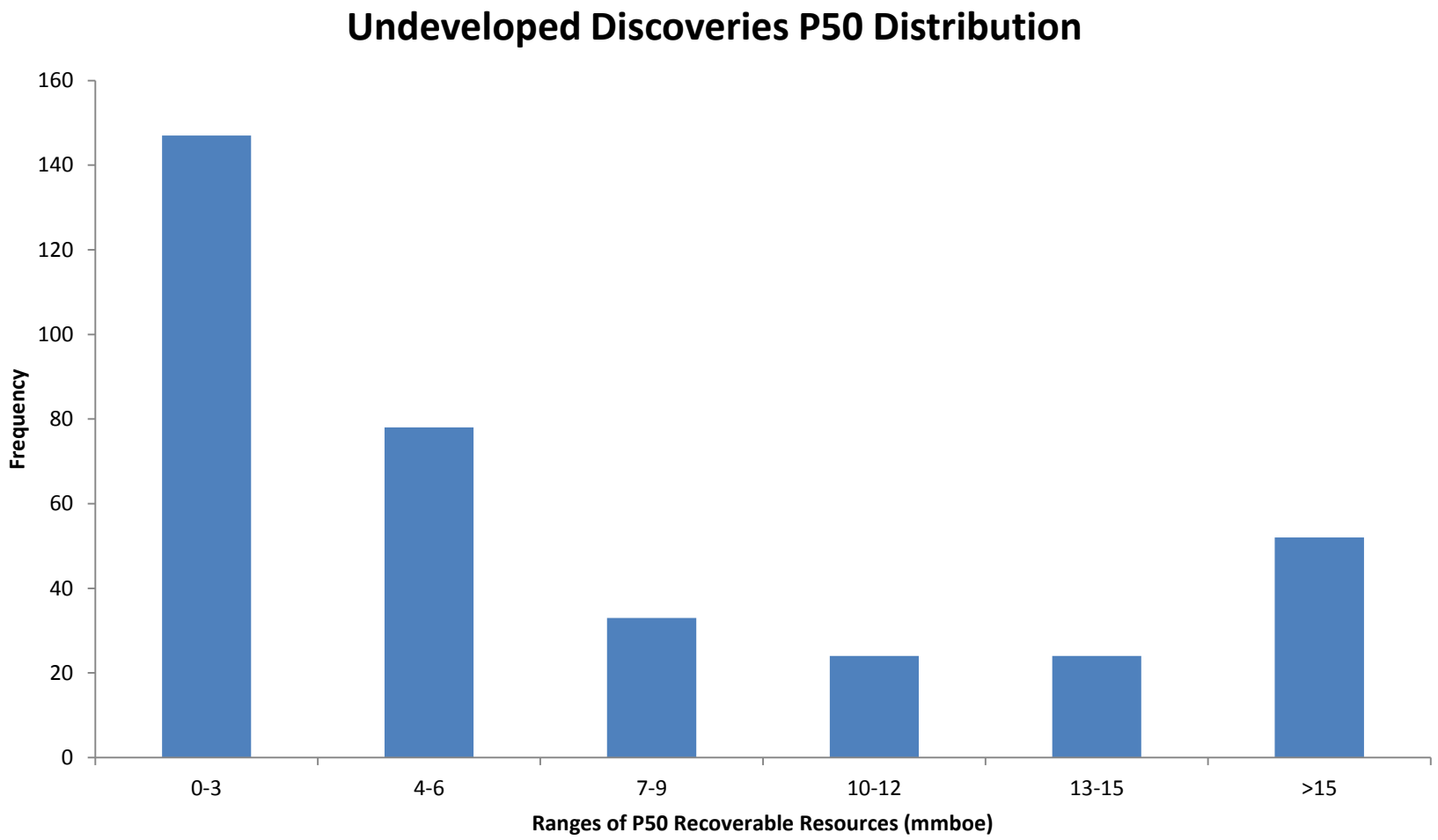
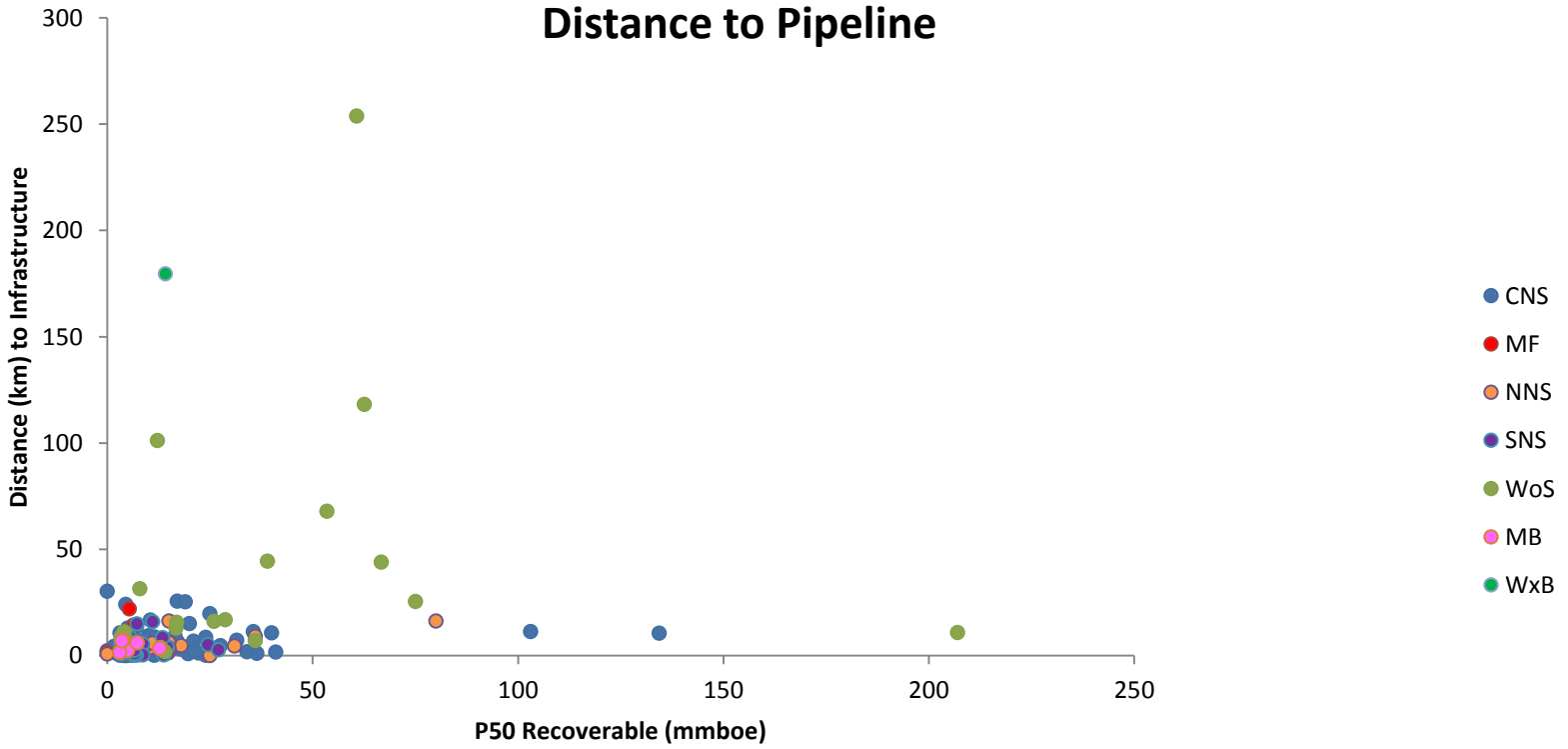
2015 DATA



Oil & Gas Authority

2014 DATA

Pipeline



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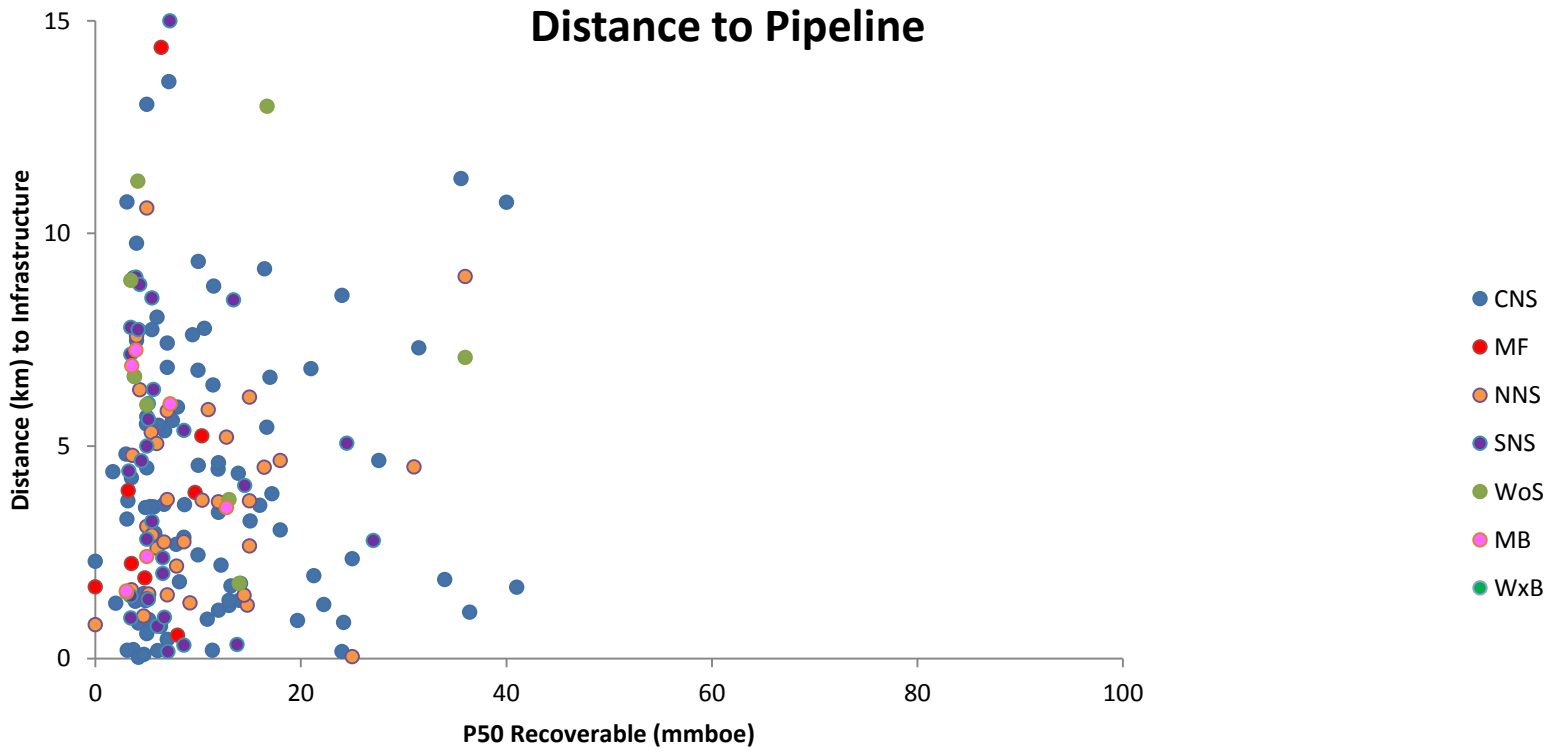
Pipeline – Focused Graph



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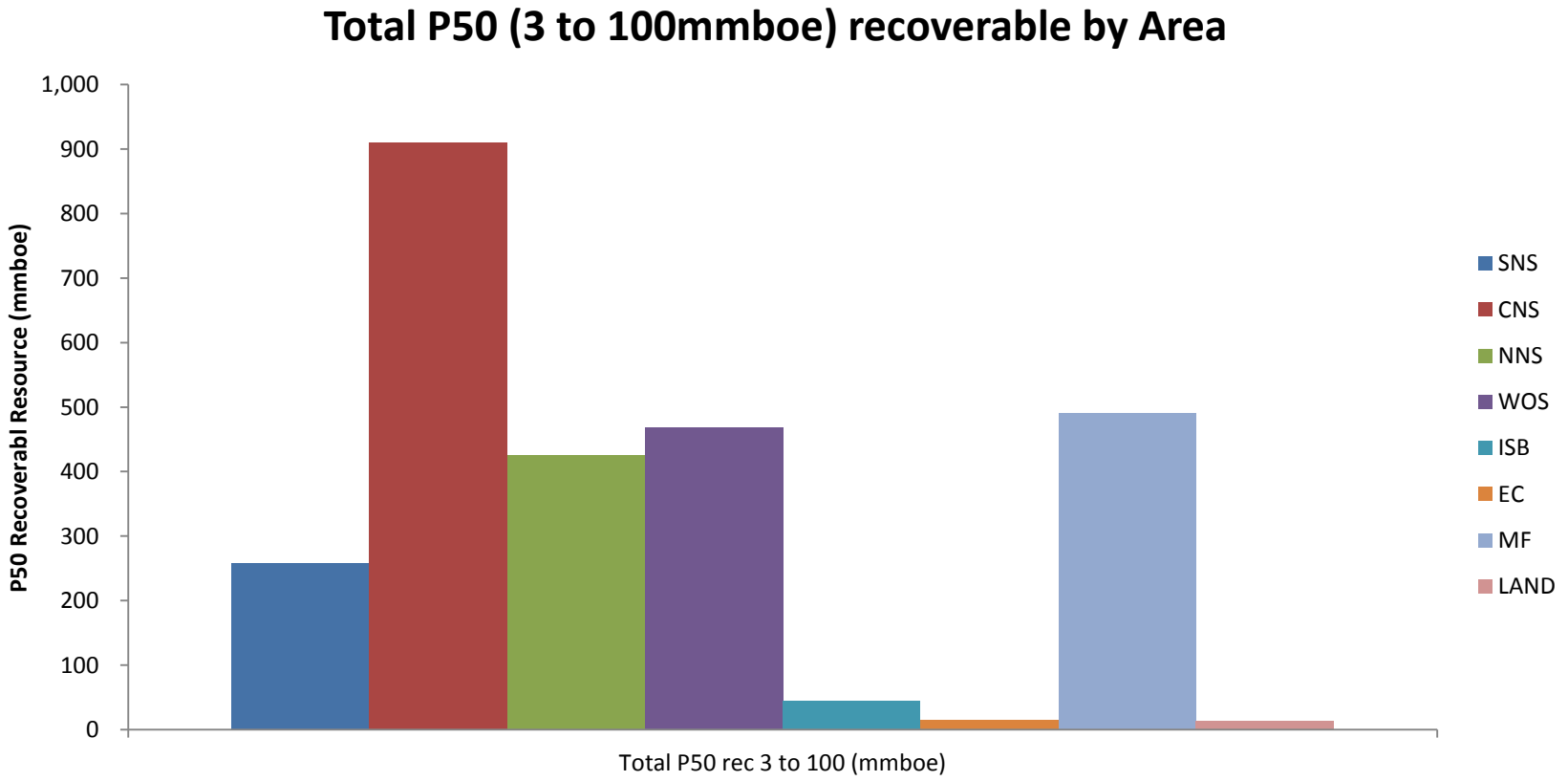
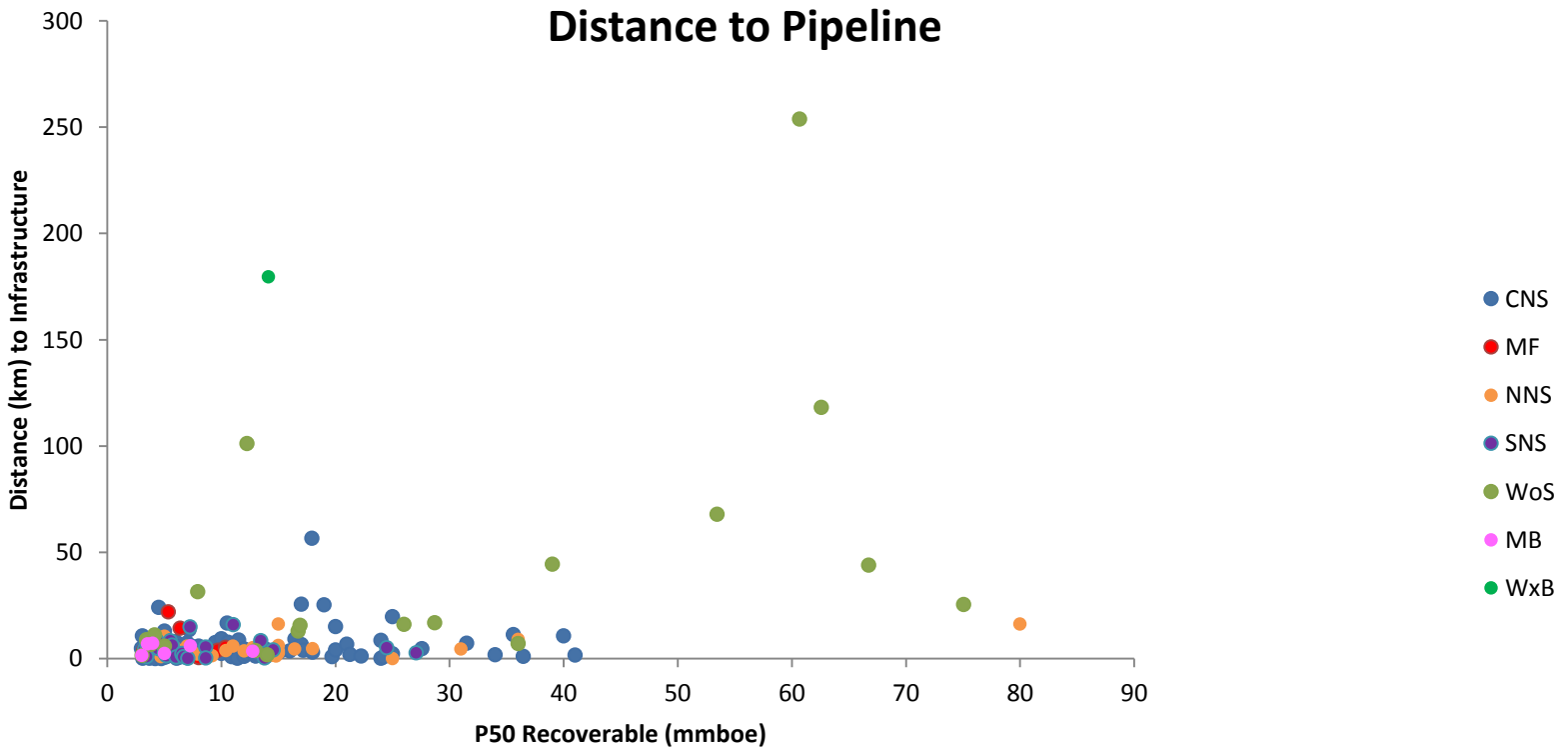
Beacon is included in EC

Resources by area: Changing small pools to pools..



Oil & Gas Authority

Pipeline



Overview

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- **Conclusive remarks**

Conclusive Remarks

- The scope for stand alone facilities is not as big as was anticipated
- Changing small pools definition to 3 – 100 mmBoe effectively doubles the size from ~1200 to ~2600 mmBoe although the concentration is in the range 3-50mmBoe

Conclusive Remarks

Very Coarse economics

- *Oil price $40 /bbl*
- *Lifting costs (best case) $15/bbl (assumes tank soln comparable)*
- *Pre tax profit margin say 20%*

  40 – (0.2 x 40) – 13 = $17/bbl

- *Capex for development of*

Pool size	$
10mmboe	170 million
25mmBoe	425 million
50mmBoe	850 million

Conclusive Remarks

Very Coarse economics

- *Looking at it another way*
  - *Conventional subsea tie back flowline typically $3million / KM*

Can subsea storage be competitive

These aspects should be kept in mind this afternoon: its technology at a price;

Further work

NSRI remains committed to identifying the size of the prize, communicating that and ensuring technology developers efforts are targeted to a specific, market application.

Enjoy your day